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10/594,618	01/30/2008	Timothy John Hughes	038871.58287US	5012

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EXAMINER	
LANDEROS, IGNACIO EMMANUEL	
ART UNIT	PAPER NUMBER
3785	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/594,618	HUGHES ET AL.	
	Examiner	Art Unit	
	IGNACIO E. LANDEROS	3785	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 August 2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *1-9 and 11-13* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-9 and 11-13* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *01 August 2011* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This office action is in response to the amendment filed on 08/01/2011. Claims 11-13 have been entered into prosecution.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-8 and 11-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Claims 1, 8, 11, 12 and 13 have limitations drawn to an "article" or a "component" that is to be cooled. However it is indefinite what this "article" or "component" is. According to Applicant's specification, the superconducting windings are ultimately what are in need of cooling. However it is indefinite how the cryogen fluid can be in the interior of the superconducting windings. The windings don't appear to be hollow. Also, the claims seem to be inconsistent in regards to what that article/component is. In claims 1 and 8 the article/component can be the helium gas itself, whereas in claims 11-13 the article can be the superconducting windings or the structure (i.e. Xu helium pressure vessel 4) **(Figure 1)** that contains a reservoir of helium gas/liquid. As best understood, the article/component is interpreted to be the helium gas in claims 1 and 8 and superconducting windings in claims 11-13.

5. Claims 2-7 are rejected due to their dependency on claim 1.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-9, 11-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Xu et al. (US Patent No. 5,918,470), herein referred to as Xu.

Regarding Claim 1 and 3, Xu discloses a cooling apparatus **(See Figure 1)** comprising a removable cryogenic refrigerator (i.e., two-stage cryocooler 12) and a thermal interface (i.e. surfaces of cold head 30) **(Figure 1)** between the removable cryogenic refrigerator and an article to be cooled by the cryogenic refrigerator (i.e. helium gas 40) **(Figure 1)**, a thermal interface consists of a gas (i.e. gas inside of cavity 32) **(Column 4, Lines 21-26)** held in thermal contact with a cooling surface (i.e., cold head 30) of the refrigerator within a recondensing chamber (i.e., cavity 32), and the article (i.e., helium gas 40) is cooled by thermal conduction through a wall (i.e., heat sink 11) of the closed recondensing chamber. Xu discloses trapped gases contained in the thermal interface gasket will escape into the recondensing chamber (i.e., cavity 32) once the refrigerator has been installed **(Column 4, Line 21-26)**. In addition, the recondensing chamber is not disclosed to be vacuum sealed when the refrigerator is installed, thus at least natural gas exists in the recondensing chamber. Further, Xu teaches the radiation shield, which is in thermal communication with the first stage cooler (16), to be cooled to

55K **(Column 2, Line 61-Column 3, Line 1)**. Therefore the recondensing chamber (i.e., cavity 32) must be in a temperature range of 55K to 4K (i.e., the second stage cooler temperature is 4K) **(Column 3, Line 27-30)**. At 55K natural gas, helium, and other gases condense into liquids as they come in contact with heat exchanging surfaces. It is then properly concluded that a gas trapped inside of the recondensing chamber recondenses into liquid as it comes into contact with a cooling surface (i.e., cold head 30). Inherently, the liquid will fall to the bottom of the recondensing chamber due to the force of gravity, and thus will be in contact with the bottom wall (11). Xu teaches the gravitational phenomenon on liquids in column 3, lines 33-34 and again on column 3, lines 46-47.

Regarding Claim 2, Xu discloses a cryogenic refrigerator (12) mounted within a sleeve (i.e., sleeve assembly 8, 18, 23) **(Figure 1)**. The sleeve (8, 18, 23) encloses the recondensing chamber (32) **(Figure 1)**. As discussed above, the recondensing chamber (32) includes trapped gases, and thus the volume within the sleeve surrounding the refrigerator forms the closed recondensing chamber.

Regarding Claim 4, Xu discloses the bottom wall (11) of the closed recondensing chamber to be in thermal contact with a further recondensing chamber (39), which recondenses a cryogen gas (i.e., helium 5) **(Column 3, Line 27-33)** and is sealed from the closed recondensing chamber of the interface (i.e. heat sink 11 and gasket 29 seal

recondenser chamber 39 from cavity 32 (crycooler 12 is inserted into vacuum vessel 2 without destroying the vacuum)) **(Column 2, Lines 46-51, see Figure 1)**.

Regarding Claim 5, Xu discloses the cooling surface (30) to be provided with fins (42) via thermal interface (29) and bottom wall (11) **(Figure 1)**.

Regarding Claim 6, Xu discloses a cryostat (i.e., two-stage cryocooler 12) **(See Figure 1)** comprising a cryogen vessel (i.e., helium pressure vessel 4) containing a liquefied cryogen (i.e., liquid helium surface level 44), a recondenser (i.e., recondenser 39) exposed to the interior of the cryogen vessel via liquid and gas helium passage 52 and 58, and the recondenser being connected to the cooling apparatus set forth in claim 1 (discussed above) **(Column 3, Line 9-20)**.

Regarding Claim 7, Xu discloses an MRI system (10) **(Column 2, Line 42)** comprising superconducting windings (i.e., superconducting magnet coil assembly 60) contained within a cryogen vessel (4) **(Figure 1)**.

Regarding Claim 8, Xu discloses a thermal interface (i.e. surfaces of cold head 30 inside of cavity 32) comprising a closed recondensing chamber (32) that is disposed around a recondensing refrigerator (12) and in thermal contact with a component to be cooled through a wall (i.e., helium gas 40 condensed at the surface of wall 11) **(Column 3, Lines 14-32)** of the closed recondensing chamber, the closed recondensing chamber

being filled with a gas which is recondensed into a liquid by the recondensing refrigerator (discussed above in claim 1) whereby thermal contact between the recondensing refrigerator and the component is provided by recondensation of the gas via the wall (11) of the closed recondensing chamber (32) **(Figure 1)**.

Regarding Claim 9, the method limitations of claim 9 comprise the same structure as set forth in claim 1, above. A cryostat is equivalent to a cryogenic refrigerator. The cryogenic refrigerator discussed above recondenses cryogen gas (i.e., helium) generated by the heat transfer between liquid cryogen and superconducting windings (60). The walls of the recondenser (39), including the fins (42), provide recondensing surfaces and are in thermal contact with the bottom wall (11) of a closed recondensing chamber (32) of a thermal interface (29) and are exposed to the cryogen gas via helium gas passage (52) within the cryostat (i.e., helium pressure vessel 4). The recondensing surfaces are cooled by cooling the component (i.e., superconducting windings 60) through the wall (11) of the closed recondensing chamber of the thermal interface (29) **(Column 3, Line 9-35, Figure 1)**. As discussed above in the rejection of claim 1, cavity 32 is properly interpreted to be a recondensing chamber, because it condenses gases due to its low temperature surfaces **(see cl. 1, lines 9-20, above)**.

Regarding claim 11, Xu discloses a cooling apparatus **(see Figure 1)** comprising a cryogenic refrigerator (i.e. two stage cryogenic refrigerator 12) **(Figure 1)**, a thermal interface (i.e. outer surfaces of cold head 30) **(Figure 1)** that is in thermal contact with a

cooling component of the refrigerator (i.e. outer surfaces of cold head 30 are connected to the rest of the cryogenic refrigerator 12) **(Figure 1)** and with an article that is to be cooled (i.e. helium gas 40) **(Figure 1)**, the thermal interface comprises a closed recondensing chamber (i.e. cavity 32) **(Figure 1)**, at least a portion of which is in thermal contact with the cooling component of the refrigerator (i.e. cavity 32 is in thermal contact with all of the cryogenic refrigerator 12) **(Figure 1)**, the closed recondensing chamber is filled with a cryogen gas (i.e. trapped gas/natural gas fills cavity 32 when the cryogenic refrigerator 12 is installed) **(Column 4, Lines 21-26)**, and is separated and sealed from a cryogen fluid contained in the article that is to be cooled (i.e. cavity 32 is separated from vacuum vessel 2 (vacuum sealed vessel) and helium pressure vessel 4 which contain helium gas 40 that is used to cool superconducting magnet coil assembly 60) **(Figure 1)** by a wall (i.e. heat sink 11) **(Figure 1)** that is in thermal contact with the cryogen fluid in the article to be cooled (i.e. heat sink 11 and fins 42 provide heat transfer surfaces for condensing helium gas 40) **(Column 3, Lines 14-33)**, the recondensing chamber is configured such that, in an operating state, gas that is liquefied in the recondensing chamber accumulates adjacent to the wall and is boiled off by heat transferred from gaseous cryogen fluid in the article that is to be cooled (i.e. energy can be neither created nor destroyed, thus the heat that is given off by helium gas recondensing at heat transfer surfaces 42 and 11 is transferred to the matter inside of cavity 32, which is also contains gas. The trapped gas/natural gas inside of cavity 32, adjacent to wall 11, inherently absorb heat energy from the helium gas inside of the recondensing chamber 39, therefore the trapped gas/natural gas

inside of cavity 32 will boil into a gas and recondense into a liquid so long as the helium is also recondensing into a liquid).

Regarding claim 12, Xu discloses a cryogenic cooling apparatus **(see Figure 1)** comprising a cryogenic refrigerator (12) **(Figure 1)**, a first recondensing chamber (i.e. cavity 32) **(Figure 1)** that is filled with a gas (i.e. trapped gas/natural gas as the cryogenic refrigerator is installed) **(Column 4, Lines 21-26)** and is in thermal contact with a cooling component of the cryogenic refrigerator (i.e. trapped gas/natural gas inside of cavity 32 is in thermal contact with the entire cryogenic refrigerator 12) **(Figure 1)**, a second recondensing chamber (i.e. recondensing chamber 38) **(Figure 1)** that is in thermal contact with the first recondensing chamber (i.e. recondensing chamber 38 is in thermal contact with the cavity 32 via heat sink 11) **(Figure 1)** and with an article that is to be cooled (i.e. superconducting magnet coil assembly 60) **(Figure 1)**, the first recondensing chamber is separated from the second recondensing chamber by a common structural component (i.e. heat sink 11) **(Figure 1)** which forms a heat transfer path between the first and the second recondensing chamber (i.e. any structure between two components that have a temperature difference inherently forms a heat transfer path between the two components having a temperature difference), and which seals and isolates the first recondensing chamber from the second recondensing chamber (i.e. there is a vacuum vessel (vacuum sealed vessel) which the cryogenic refrigerator does not destroy within the cavity 32, thus cavity 32 and recondensing chamber 38 are sealed and isolated from one another) **(Column 2, Lines 46-51, Figure**

1), the second recondensing chamber is in thermal contact with a cryogenic fluid (i.e. helium gas 40) **(Figure 1)** in the article (i.e. superconducting magnet coil assembly 60) **(Figure 1)** that is to be cooled.

Regarding claim 13, Xu discloses the second recondensing chamber (38) to be in fluid communication with the cryogen fluid (helium gas 40) **(Figure 1)** that is contained in an interior of the article that is to be cooled (i.e. superconducting magnet coil assembly 60) **(Figure 1)**.

Response to Arguments

8. Applicant's arguments filed 08/01/2011 have been fully considered but they are not persuasive.

9. On page 9, first paragraph, Applicant states that new drawings have been submitted to overcome the drawing objection. Examiner agrees and has withdrawn the drawing objection.

10. On page 9, second paragraph, Applicant states that brackets were necessitated by previous amendments. Examiner agrees and has withdrawn the objection to the claims.

11. On pages 11-12 (all lines), Applicant argues that Xu does not disclose a thermal interface that consists of a gas held in thermal contact with a cooling surface of the refrigerator. Examiner respectfully disagrees. In a cooling system like the present invention, there are several "thermal interfaces" present or locations where thermal energy is exchanged. Although Xu specifically discloses a thermal interface gasket,

there is also a thermal interface before the gasket where the cold head 30 interacts with its surroundings, which include gas that fills the volume surrounding the cryogenic refrigerator 12 **(see Figure 1)**. Therefore this thermal interface consists of a gas held in thermal contact with a cooling surface (i.e. cold head 30) of the refrigerator.

12. On pages 13-14 (all lines), Applicant argues that Xu does not disclose cavity 32 to be a recondensing chamber, and further that Xu does not disclose two recondensing chambers, which renders the new claims (11-13) patentable. Examiner respectfully disagrees. Although Xu does not label cavity 32 to be a "recondensing chamber", it can be properly interpreted to be a recondensing chamber. As discussed above in the rejection of claim 1, cavity 32 is a vessel that contains trapped gas/natural gas, which condenses into liquid at 55K. So long as helium, on the other side of the heat sink 11, is recondensed into liquid helium, some matter must absorb the heat given off by the helium gas as it is recondensed because energy can neither be created nor destroyed. Thus the gas surrounding the cold head 30 in cavity 32 must at least partially absorb this energy, and thus boil into a gas, which is then liquefied again by the cold head 30. Therefore, and as evident by the Applicant's (page 13, lines 10-12) remark, cavity 32 can be properly interpreted to be a recondensing chamber. In conclusion, Xu explicitly discloses a recondensing chamber 38 and implicitly discloses another recondensing chamber (i.e. cavity 32) **(Figure 1)**, thus there are two recondensing chambers disclosed by the prior art.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to IGNACIO E. LANDEROS whose telephone number is (571)270-1875. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Judy Swann can be reached on (571) 272-7075. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J J Swann/
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